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Research Briefing No.8

(In)visible Witnesses:

Young people's views of images of scientists, technologists, engineers and mathematicians on UK children's television from a gender perspective

For over 30 years there has been interest in how young people's, particularly girls', images of scientists, technologists, engineers and mathematicians (STEM) are constructed. Studies have examined how children's views of science and scientists develop as they grow up and why girls' (and boys') participation in school science declines with age. Key factors include a decline in many girls' self-belief in their abilities in science, particularly the physical sciences, as they grow older. In addition many girls reject the stereotypically masculine images of science and scientists as one that they could adopt for themselves. The images of STEM that some girls (and some boys) are uncomfortable with are still pervasive and do not evolve from the educational environment alone.

This briefing is based on the (In)visible Witnesses study by a team of researchers led by Liz Whitelegg and Richard Holliman at the Open University. This project is one of five commissioned by the UKRC to explore issues around the role of the media and representations of women in STEM.

This briefing looks at the (re)construction of gendered representations of STEM on children's television and investigates the ways in which these images affected children's and young people's perceptions of STEM.

The content of two weeks of children's television was analysed. Following this, 45 children and young people were involved in a study which looked at how children and young people made sense of the STEM they watch on television. Several methods were used to elicit children's and young people's perceptions of STEM and their place within these fields in the future - a questionnaire, 'draw-a-scientist' test, reflective writing about their future selves as scientists and the creation of a 'storyboard' for a TV programme.

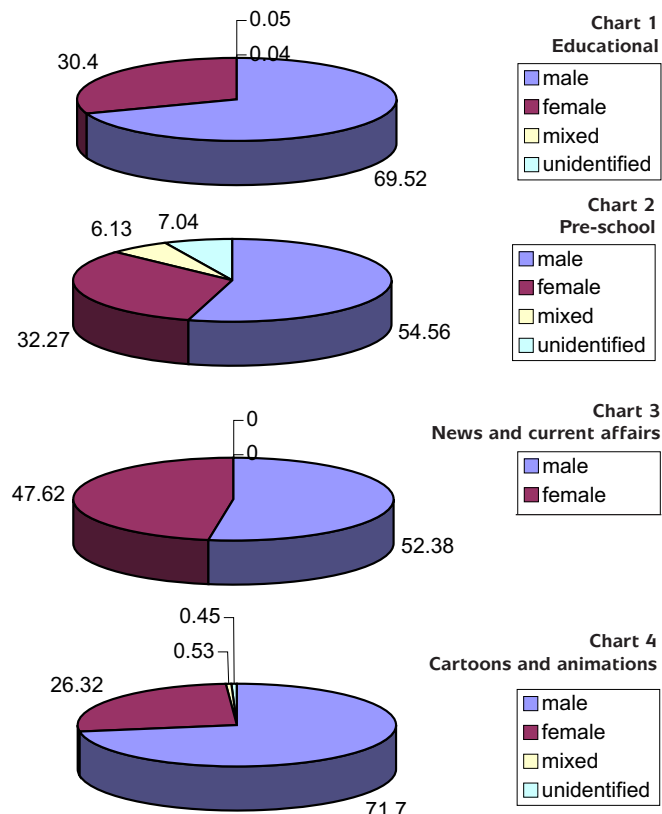


Gendering of STEM on children's television

The programmes broadcast within two sample weeks in specific schedules for children and young people were divided into the following categories:

- news and current affairs
- animated cartoons
- educational
- pre-school
- other

and extracts containing STEM were coded for all recorded speech and analysed by gender. The results are show below:



1. In each type of programme more words are spoken by males than females, but only marginally so for the 'News and current affairs' and 'Pre-school' categories.
2. Educational programming formed the largest proportion of programmes for children and young people (41%), and the gender distribution of words spoken within this category was 70/30 in favour of males.
3. Cartoon and animations had the largest gender difference in words spoken with over 70% spoken by males and less than 30% by females.

where mechanical engineering was an important local activity. It is therefore likely that the children's focus on one role for engineering as a profession reflects their real-world experiences of engineers. This highlights the potential for other representations, such as those experienced through television, to enable children and young people to imagine a more diverse set of roles for engineering.

However, very few participants identified STEM as a subject more suitable for boys than girls and similar numbers of girls and boys said STEM was important for them. It was mostly the younger children who identified a possible future for themselves working in STEM. This is in keeping with other research findings suggesting that liking for science declines with age.

What do scientists look like?

The children were asked to 'draw a scientist' and then give them a name. 73% of the drawings of scientists were identified as drawings of males. Only six drawings were of female scientists and these were all, except one, drawn by the younger, primary-aged girls.

On average, the drawings done by girls had fewer stereotypical signals of science and scientists than those drawn by males. Three girls drew pictures of themselves, but only one of these drawings contained any definite indication that the girl was drawing herself 'as a scientist'. One girl drew an androgynous figure with added notes implying that scientists could be either gender. In this respect, this participant demonstrated a sophisticated understanding of the nature of stereotypes and role models. These findings are consistent with other recent large-scale 'draw-a-scientist' tests where images of female scientists have also been produced by girls, but very rarely by boys.

1. When attempting to represent a visual image of scientists in their own drawings the majority of participants chose to represent the scientist as male.
2. We have found some evidence that some girls are willing to imagine women as scientists, and also that they could become these scientists. These particular images have far fewer of the stereotypical codes associated with male scientists.



Children's images of STEM on children's television

Do you know a Scientist or Engineer?

Nineteen of the forty five students who completed the questionnaire said that they knew a scientist or an engineer: only four of those were female. All the primary aged children defined engineers as 'people who fix things' and all of these were males. This study took place in an area



No single image of a scientist, engineer, technologist or mathematician will appeal to all children. Rather, we need multiple, diverse television portrayals of females and males working in these roles.

Who is the scientist, engineer or mathematician?

Most children and young people were able to identify who were the scientists and engineers in the TV extracts they were shown, most often when they were male figures, and when screen captions made it really clear by naming them and giving their title. In some instances however, when a woman was the expert scientist and was not clearly named as such, the participants were not able to identify the female as the expert. This issue of non-identification could be a problem.

The children and young people were very aware of the difference between presenters who talk about STEM and STEM experts. However, whether these non expert presenters have a positive affect on children's self-concept and subsequent participation in STEM requires further analysis of what children think it means to work in STEM occupations.

The importance of animated cartoons

In the study animated cartoons showed the greatest gender differences and the images presented in these programmes were remembered long after these programmes were broadcast. They are therefore likely to have a significant impact on how children and young people conceptualise STEM particularly as they are part of long running series and are often repeated.

Children and young people demonstrated the ability to accurately recall STEM-related storylines from a range of television programmes and interpret the personalities of characters, identifying both positive and negative connotations.

There were very few instances where they identified a programme as containing mathematics, which suggests that children and young people have very little exposure to representations of maths and so may not think about engaging with this area in the future as a career.

1. Participants use certain indicators (e.g. body language, how other people react to the expert, the job title on the screen) to identify which characters within programmes are STEM experts, and have some difficulty identifying those experts when those indicators are not present.
2. Animated cartoons provide a significant cultural resource where children have access to images of STEM.

How would children present STEM on television?

The children and young people designed and planned a television programme about science, technology, engineering and/or mathematics, by creating a storyboard. This proved a very rich source of data and was the most popular activity with the children and young people. The most sophisticated idea adopted a format that combined a game show with that of 'reality TV'.

This approach could be useful as classroom activity and may produce guidelines for TV production staff to consider.

Children were capable of demonstrating sophisticated media literacy skills when creating ideas for their own television programmes. They demonstrated extensive knowledge and experience of programme formats and the ways that science, technology, engineering and mathematics have been and might be portrayed on children's television.

What sort of scientist or engineer would you want to be?

In order to examine whether the children saw a place for themselves in STEM in the future we asked them to undertake a reflective writing activity, where they imagined themselves as adults working in a STEM career.

Of those who identified themselves as scientists, four were associated with teaching and the remaining eighteen had a variety of careers such as working in: laboratories and research centres; a sewerage treatment plant; a science museum; offices; and a hospital. Unlike those who aspired to be engineers, participants felt that scientific careers didn't appear to offer the same conditions of self-employment, or consultancy; and only two of the future scientists mentioned financial reward as an incentive. Science was seen in the role of 'problem solver' for such areas as disease or environmental issues. The themes that did emerge, however, may be more realistic in terms of working as a scientist than the future engineers displayed, and reflect the diversity of work that scientists might do..

Several of the children who described careers in engineering again referred to the mechanical aspects to do with fixing things. However, equal numbers of girls and boys put themselves in these roles. The children felt that careers in engineering offered opportunities for 'problem solving', as opposed to 'problem creating'; independence; status and financial reward; travel; and job satisfaction.

One girl said:

'My job is especially fun at times because being that I'm allowed to experiment with energy production, where there is some risk involved! Brilliant! It's also very interesting and motivating work. Of course my job is exceptionally vital in the world of science presently: with the horrible truth of global warming – and time running out....' (Quote from KS4 female participant)

The three participants who imagined themselves as mathematicians all interpreted the role as a mathematics teacher in a school.

1. For these children and young people, scientists and engineers 'solve problems'.
2. Jobs in engineering were perceived to offer more flexibility than those in science.
3. Children had difficulty identifying roles, other than teaching, that mathematicians might play in the workplace.

Selected Recommendations

- Greater emphasis should be placed on increasing the range of diverse, authentic representations of female scientists, technologists, engineers and mathematicians in fictional children's television programming particularly within animated cartoons; not only those who conform for instance to a slim, attractive, bespectacled image. noted as emerging by other research.
- When a woman is used as an expert, programme makers should display her as an authority figure, using her title and profession on screen.
- Targets should be introduced for the number of female and male experts in a wider range of children's television programmes. Achievement of these targets should be published regularly by broadcasters, alongside short—medium—long-term plans for how they are being improved.
- There is scope to present imagined, idealized images of STEM in animated cartoons, including ones that feature female scientists and engineers in central roles.
- Programme makers should engage with children and young people to find out what sort of programmes about STEM they would like to watch.
- Further work could be commissioned to investigate how pre-school children make sense of STEM in TV programmes and the representations of gender (neutrality) therein.
- A complementary production study could be commissioned to investigate fictional representations of STEM on children's television.

The UKRC aims to increase the visibility of women in SET and work with individuals to raise their profile. As well as the research on the mass media, activities include the creation of case studies of women at all levels in SET, the Play your Part campaign, the GetSET Women database, the Women of Outstanding Achievement Photographic Exhibition, media training, a programme to get more women onto SET public bodies and work with Public Awareness of Science (PAWS).

Further copies of this research briefing, the others in the series, and the full reports are all available from: www.ukrc4setwomen.org

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